21718

3 Hours / 100 Marks   Seat No.

Instructions :   (1)   All Questions are *compulsory.*
(2)   Answer each next main Question on a new page.
(3)   Illustrate your answers with neat sketches wherever necessary.
(4)   Figures to the right indicate full marks.
(5)   Assume suitable data, if necessary.
(6)   Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1.   (A)   Attempt any SIX of the following :   **12**

(a)   Define form factor for a sine wave. State its value.

(b)   Define bandwidth of a series resonant circuit and give the expression for the same.

(c)   State two advantages of three phase system over single phase system.

(d)   State Fleming's Right hand rule.

(e)   State Faraday's laws of electromagnetic induction.

(f)   Define slip and slip speed.

(g)   State any two speed control methods for three phase induction motor.

(h)   State the necessity of earthing.

(B)   Attempt any TWO of the following :   **8**

(a)   Draw the waveforms and phasor diagrams to show the relationship between V & I in pure inductive and pure capacitive circuits.

(b)   Draw a neat labelled circuit diagram of three phase delta connected system and write relationship between

(i)   Line voltage and phase voltage

(ii)   Line current and phase current.

(c) Compare squirrel cage & slip ring induction motor based on

    (i) Rotor construction

    (ii) Starting torque

    (iii) Efficiency

    (iv) Application

2. Attempt any FOUR of the following :   **16**

(a) Give the definition and expression for the following terms :

    (i) Inductive Reactance

    (ii) Capacitive Reactance

    (iii) Impedance

    (iv) Power Factor

(b) Explain the phenomenon of resonance in RLC series circuit.

(c) Draw the circuit diagram, waveforms, equations for V & I and phasor diagram for an R-L series circuit.

(d) State different types of power in AC circuits. Write its expression and unit.

(e) State and explain the principle of 3ϕ emf generation. Draw its waveform.

(f) Compare autotransformer & two winding transformer. (any 4)

3. Attempt any FOUR of the following :   **16**

(a) Compare dc supply with ac supply.

(b) Define leading and lagging ac quantities. Draw waveform representation and equations representing the same.

(c) A choke coil is connected across 230 V, 50 Hz supply. The power consumed by the coil is 960 W and current I_{rms} is 8A. Calculate the circuit constants R & L.

(d) Compare magnetic circuits with electric circuits.

(e) Explain : (i) Statically induced emf.

             (ii) Dynamically induced emf.

(f) Give constructional features of isolating transformer. State its working principle and applications. (any 2)

4. **Attempt any FOUR of the following :** 16

(a) A coil of resistance 10 Ω and 0.1 H is connected in series with a capacitance of 150 μF across 230 V, 50 Hz ac supply. Calculate impedance, current, power factor and power consumed by the circuit.

(b) State the emf equation of a single phase transformer. Define
   (i) Current Ratio
   (ii) Transformation Ratio
   (iii) Voltage Ratio

(c) Draw and explain torque speed characteristics of 3 phase induction motor.

(d) Explain the construction and working principle of 3 phase induction motor with a neat diagram.

(e) Draw schematic representation and explain the principle of working of split phase single phase induction motor.

(f) Explain the working principle of AC servo motor and state any two applications.

5. **Attempt any FOUR of the following :** 16

(a) An alternating current is given by i = 10 sin 628 t. Calculate
   (i) Average value
   (ii) RMS value
   (iii) Frequency
   (iv) Time period

(b) If a 3φ 400 V, 50 HZ supply is connected to a balanced 3φ star connected load of impedance (3 + i6) Ω per phase,

   Calculate : (i) Phase Current
   (ii) Power Factor
   (iii) Total Active Power
   (iv) Phase Voltage

(c) A 25 kVA, single phase transformer has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1500 V, 50 Hz mains.

   Calculate : (i) Primary and secondary currents on full load.
   (ii) Secondary emf.
   (iii) Maximum flux on the core.

(d) State the necessity of starter in case of three phase induction motor and explain.

(e) Explain any one method of speed control of single phase induction motor.

(f) Give any two applications for each,

    (i) Universal Motor

    (ii) Stepper Motor

    (iii) Servo Motor

    (iv) Split Phase Induction Motor.

6. **Attempt any FOUR of the following :**   **16**

(a) Three impedances each of 3 Ω resistance and 5 Ω reactance in series are connected in delta across 50 Hz, 440 V line voltage. Find,

    (i) Impedance

    (ii) Phase current

    (iii) Power factor

    (iv) Total power

(b) A 50 kVA, 1 – ϕ transformer has a full load on loss of 4 kW and iron loss of 2 kW. Find the efficiency of the transformer at half and full load with a power factor of 1.

(c) A 20 kVA, 3300/240 V, 50 Hz, 1 – ϕ transformer has 80 turns on secondary winding. Calculate number of primary turns, full load primary and secondary currents and maximum value of flux in the core.

(d) Draw the schematic representation and state the working principle of servo motor.

(e) Explain the principle of operation and reversal of rotation of universal motors.

(f) State the use of megger. Draw its front panel diagram and different control terminals.

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